PROJECT DATA

OG Technologies - 01GO11033

A Hot Eye™ Based Coordinate Measuring Machine for the Forging Industry

Recipient:	OG Technologies	Instrument Number:	DE-FG36-01GO11033
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Recipient Type:	For Profit Organization	GO Contract Specialist:	Melissa Wise 303.275.4907
Subcontractor(s):		B & R Number(s):	ED1906020
		PES Number(s):	01-2031
EERE Program:	Industrial Technologies	State Congressional District:	MI - 13

PROJECT SCOPE: The objective of this project is to develop a three dimensional measurement system for the domestic forging industry based on HotEye™, a technology that allows a high definition camera to accurately image a red hot object. HotEye™ will be integrated into conventional Coordinate Measurement Machine (CMM) technology. The domestic forging industry will be shown dramatic reductions in scrap generated during the forging process with the HotEye™ device, and subsequent reductions in energy, waste and costs.

FINANCIAL ASSISTANCE

Approved DOE Budget	$200,000	Approved DOE Share	$200,000
Obligated DOE Funds	$200,000	Cost Share	$265,059
Remaining Obligation	$0		
Unpaid Balance	$0	**TOTAL PROJECT**	**$465,059**

Project Period: 4/15/01-3/31/04

TECHNICAL PERFORMANCE
DE-FG36-01GO11033
OG Technologies
A Hot Eye ™ Based Coordinate Measuring Machine for the Forging Industry

PROJECT SYNOPSIS

The objective of this project is to develop a three dimensional measurement system for the domestic forging industry based on HotEye™. This technology will allow a high definition camera to accurately image a red hot object. The project marries conventional Coordinate Measurement Machine (CMM) technology to HotEye™ technology to permit the accurate measurement of forged parts while they are at high temperature. Being able to take such measurements will dramatically reduce the amount of scrap produced by the domestic forging industry. This industry wastes a significant amount of energy because of the high rate of scrap it produces. Forging industries will benefit greatly from this invention due to the dramatic reduction of scrap that HotEye™ will bring. The near term energy savings would be 406 billion Btu per year with a future potential of 4.1 trillion Btu per year.

SUMMARY OF TECHNICAL PROGRESS

The project has been successfully completed with very encouraging results. The technical goals have been fully accomplished. OG Technologies is fully committed to completing the necessary work for full commercialization. This project developed a 3D measurement sensor head (HotEye™). The sensor head is capable of scanning an area of 80 mm by 120 mm within 10 seconds. The sensor head has also been tested for the capability of scanning an object that is as hot as 1500^{o}C.

Software has been developed for Virtual-Fixturing (VF) to alleviate the need of precise hard fixturing. The prototype is only equipped with a very simple and inaccurate hardware fixture. The software is capable of measuring the surface profile of the part and adjusting the attitude of the part for the needs of getting the exact perspectives. The 3D measurement sensor head and software package were integrated into a CMM form system.

The prototype was tested and evaluated in the shop floor of TECT Cleveland, Inc. for more than three months. During the period, the accuracy of the prototype was evaluated twice. Evidence has shown that the system can sustain the forging shop floor environment and maintain its accuracy. Furthermore, the system was tested on both cold turbine blades and hot turbine blades. The system was used to measure the blade surface profile dimensions as soon as the blades left the trim press, the final stage of the forging process. TECT personnel were trained to operate the prototype to ensure the user-friendliness of the prototype system. OG Technologies is attempting to match the measured data cloud to the blade CAD model. To support this additional test, the prototype system was still being kept in TECT as the project ended.

SUMMARY OF PLANNED WORK

The project has been completed successfully and the final report has been submitted and is under review. This award is ready for close-out.

PROJECT ANALYSIS

The project has been successfully completed. OG Technologies and TECT are continuing to work together for successful commercialization of the HotEye™ Technology.

ACTION REQUIRED BY DOE HEADQUARTERS

No action is required from DOE Headquarters at this time.

STATEMENT OF WORK

DE-FG36-01GO11033

OG Technologies

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Detailed Task Description

Task 1.

Develop a 3D measurement sensor head that will work on a part at a temperature up to 1,450°C with an accuracy of 0.1mm or better and with a scanning speed of less than 10 seconds for an area of 100mm x 100mm.

Task 2.

Develop a Virtual-Fixturing software package to alleviate the need of precise hard fixturing.

Task 3.

Integrate the 3D measurement sensor head and the Virtual-Fixturing software into a standard CMM, both hardware (replacing the probes) and software (data format and user interface match), so that the system can automatically perform a complete pre-programmed measurement of a hot product.

Task 4.

Test and evaluate the system in a forging facility.

Task 5.

This demonstration will involve the performance of the following tasks:

1) Experiment Design,
2) System Design & Procurement,
3) System Integration & Implementation,
4) Prototype Tests & Refinement,
5) System Performance analysis,
6) Market analysis/business planning, and
7) Project Management & Reporting.

Project Cost Performance in DOE Dollars for Fiscal Year 2003

DE-FG36-01GO11033 **OG Technologies**

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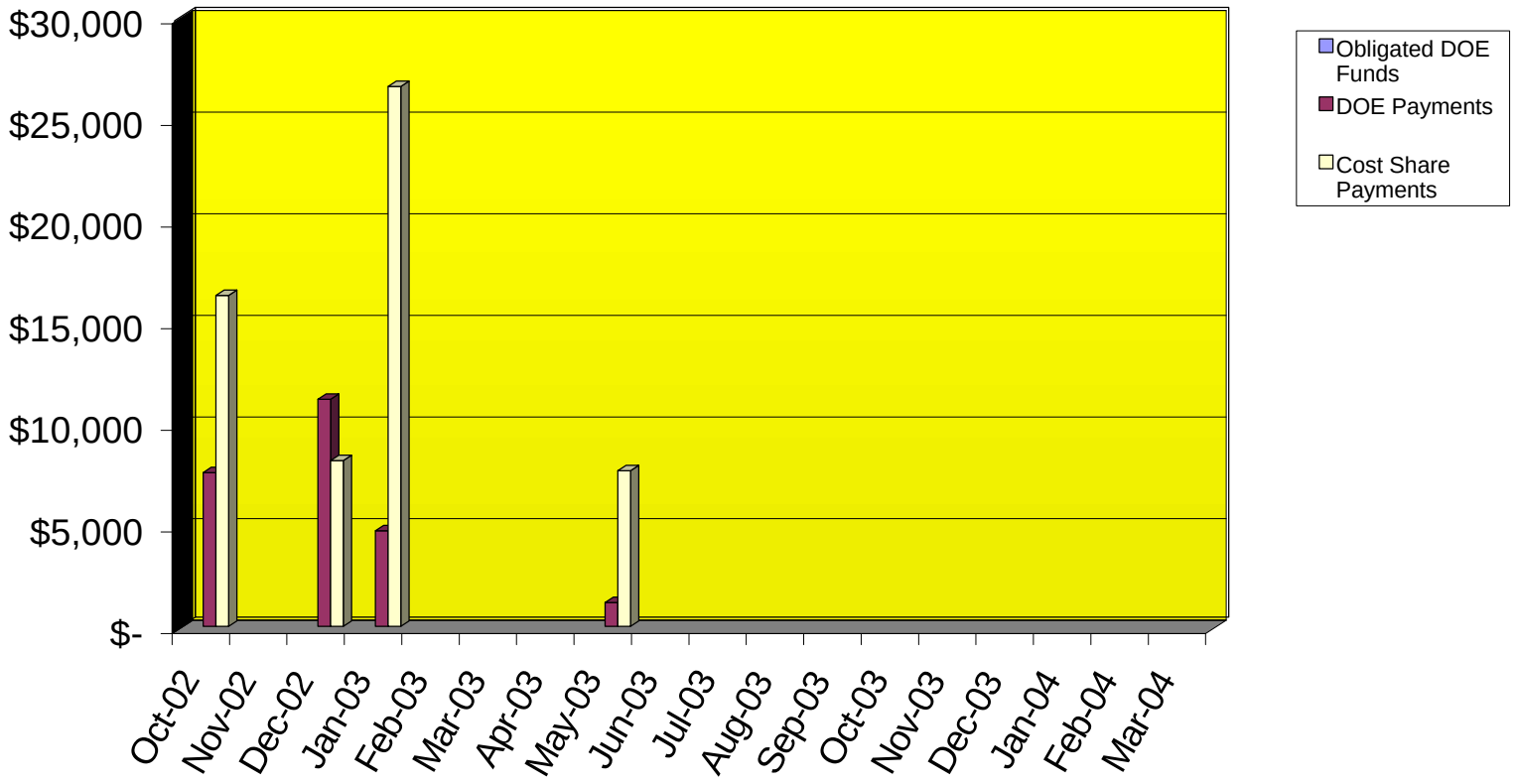

	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03
Obligated DOE Funds	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
DOE Payment	$7,576	$0	$11,184	$4,702	$0	$0	$0	$1,174	$0	$0	$0	$0
Cost Share Payment	$16,289	$0	$8,165	$26,567	$0	$0	$0	$7,656	$0	$0	$0	$0

	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	PFY*	Cumulative
Obligated DOE Funds	$0	$0	$0	$0	$0	$0	$200,000	$200,000
DOE Payment	$0	$0	$0	$0	$0	$0	$175,364	$200,000
Cost Share Payment	$0	$0	$0	$0	$0	$0	$156,141	$214,818

Approved DOE Budget:	$200,000
Approved Cost Share Budget:	$265,059
Total Project Budget:	$465,059

* Prior Fiscal Years

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Task Name	Start	Finish
Task 1: Experiment Design	Sun 4/1/01	Mon 4/30/01
Task 2: System Design and Procurement	Sun 4/1/01	Fri 8/31/01
Task 3: System Integration and Implementation	Sun 4/1/01	Fri 11/30/01
Task 4: Submit Semi-Annual Report	Sun 4/1/01	Wed 10/31/01
Task 5: Submit Semi-Annual Report	Thu 11/1/01	Tue 4/30/02
Task 6: Prototype Tests, Refinement and Performance Analysis	Thu 11/15/01	Mon 9/30/02
Task 7: On-Site System Test and Evaluation	Fri 2/1/02	Wed 10/30/02
Task 8: Market Analysis/Business Planning	Tue 5/1/01	Fri 11/15/02
Task 9: Attend Annual Project Review	Sun 6/23/02	Fri 6/28/02
Task 10: Project Management and Submit Final Reports	Sun 4/1/01	Mon 12/30/02